

**REMARKS**

**Election/Restrictions**

The Examiner found that the application contains five inventions or groups of inventions and required election of a single invention to which the claims must be restricted: Group I (claims 1-10), Group II (claims 11-12), Group III (claims 13-15), Group IV (claims 16-35 and 37-52), and Group V (Claim 36). Applicants confirm their election, without traverse, to prosecute the claims of Group I, claims 1-10.

**Status of Application**

Claims 1-10 are pending. The remaining claims have been withdrawn by the Examiner as directed to non-elected inventions. These claims have been cancelled without prejudice to their prosecution in other application(s).

**Specification**

The abstract of the disclosure has been objected to because of the usage of the word “said”. Applicants have submitted a replacement abstract, where the word “said” has been replaced with the word “the”.

**Claim Rejections - - 35 U.S.C. § 102**

Claims 1-3 and 5-10 stand rejected under 35 U.S.C. § 102 (b) as being anticipated by US Patent No. 4,874,739 (Boxhoorn). Applicants respectfully traverse this rejection.

The Examiner characterizes Boxhoorn as teaching a process for the preparation of a silver-containing catalyst suitable for the oxidation of ethylene to ethylene oxide. According to the Examiner, with regard to claim 1 of the present application, Boxhoorn teaches a step of impregnating a preformed alpha-alumina carrier (citing claims 1 and 25 of Boxhoorn), which has been subjected to calcining, and optionally other preforming treatments, as part of the preforming process (citing claims 1 and column 2, lines 44-66 of Boxhoorn) with at least one alkali metal hydroxide modifier (citing claim 3 of Boxhoorn). Further, the Examiner finds that Boxhoorn teaches an optional step of drying the impregnated carrier (citing column 4,

lines 16-20). The Examiner states that Boxhoorn teaches a step of calcining the impregnated and optionally dried carrier (citing claim 1, column 2, lines 44-66, and column 4, lines 20-39). Finally, the Examiner finds that Boxhoorn teaches a step of washing the calcined carrier (citing column 5, lines 8-11 and lines 30-35).

Applicants disagree with the Examiner's characterization of Boxhoorn and its application to the present claims. Claim 1 of Boxhoorn reads:

A process for the preparation of a silver-containing catalyst suitable for the oxidation of ethylene to ethylene oxide which comprises:

- (a) mixing alumina with a tin compound and with an alkali metal compound,
- (b) calcining the mixture to obtain an alkali metal-enriched and tin-modified alumina carrier,
- (c) impregnating the carrier with a solution of a silver compound, which is sufficient to cause precipitation on the carrier of from 1 to 25 per cent by weight, on the total catalyst, of silver and before, during or after that impregnation also impregnating the carrier with one or more dissolved alkali metal compounds and with a rhenium compound as promoters,
- (d) precipitating the silver compound on the carrier and
- (e) reducing the silver compound to metallic silver.

Thus, there are two distinct steps in claim 1 of Boxhoorn where alkali metal compounds are used, namely steps (a) and (c).

With regard to step (a), an alkali metal compound is used in preparing an alkali metal-enriched and tin-modified carrier. The preferred alkali metals are said to be potassium, rubidium and cesium. In describing the alumina that is mixed with the water, the tin compound and the alkali metal compound, Boxhoorn teaches that:

- (a) The aluminum oxides can be several modifications of aluminum oxide, such as gamma-aluminum oxide, which when calcined at a final temperature between 1200° C and 1700°C generally produce alpha-aluminum oxide. Another possibility is to choose a hydrated aluminum oxide, such as boehmite, which via gamma-aluminum oxide produces alpha-aluminum oxide. (Col. 1, lines 54-60)
- (b) Suitable starting materials are powders of gamma-aluminum oxide [gamma-alumina], alpha-aluminum oxide monohydrate [boehmite], alpha-

aluminum oxide trihydrate [gibbsite] and beta-aluminum oxide monohydrate [diaspore], which are sintered during the calcination, with fusion of the powder particles taking place. The heating and calcination also changes the crystal structure: the cubic structure of gamma aluminum oxide changes into the hexagonal structure of alpha aluminum oxide. (Col. 2, lines 58- 63) (bracketed material added by applicant to identify the common name for the materials)

Alpha-alumina, also known as corundum, is **not** identified as a starting material in Boxhoorn and, instead, is recognized as a material which is later produced after shaping, optional drying, and calcining the starting material to a temperature of between 1200 and 1700°C. Thus, the disclosure in Boxhoorn of mixing a **non-alpha-alumina** with an alkali metal hydroxide compound is clearly not the same as impregnating a **performed alpha alumina carrier** with at least one alkali hydroxide metal. Boxhoorn step (a) does not anticipate claim 1 of the present application.

With regard to step (c) of claim 1 of Boxhoorn, one or more alkali metal compounds are used to impregnate the carrier before, during or after impregnation with a silver compound. The preferred alkali metals are said to be potassium, rubidium and cesium. Boxhoorn teaches that in the case where the carrier is impregnated with an aqueous solution containing both alkali metal salt and silver salt, the impregnated carriers are then heated to a temperature of between 100 and 400°C, preferably between 125 and 325°C. (Col. 5, lines 38- 41) In Examples 1 and 2, the drying temperatures are 250 to 270°C. Thus, Boxhoorn does not teach or suggest **calcining** after impregnation with the alkali metal salt. Instead, Boxhoorn teaches heating at much lower temperatures than calcination temperatures to reduce the silver salt to silver metal.

In contrast, in claim 1 of the present application, the carrier has been calcined once, is treated with the alkali metal hydroxide modifier, and is calcined again. Thus, step (c) of Boxhoorn does not anticipate claim 1 of the present application.

The Examiner has also cited to claim 25 of Boxhoorn as teaching a step of impregnating a preformed alpha-alumna carrier with at least one metal hydroxide modifier. Claim 25 of Boxhoorn is directed to a composition-- a silver containing catalyst—not a method. Part (a) of claim 25 specifies that the catalyst comprises an

alkali metal-enriched and fine modified alpha-alumina carrier. Boxhoorn explains at col. 2, lines 34- 43 that: "It should be clear that alkali metals may be present in the alumina before the mixing of any compound, since in the raw alumina materials and ores the aluminum contains impurities of this kind. Substantial amounts, up to 10,000 ppm wt of alkali metals are not unusual. These amounts are neglected in calculations. When alkali is mixed with alumina, we say that the alumina is then "enriched". It is clear from the discussion above with regard to claim 1, step (a) of Boxhoorn, that the Boxhoorn is directed to the modification of the alumina starting materials, instead of the modification of the preformed carrier as the claims of the present application. Part (c) of Boxhoorn specifies that an alkali metal is present as a promoter. The claims of the present application, which are method claims, do not require that an alkali metal is present nor that it is present as a promoter.

Further, Claim 25, and part (c) of claim 25, must be read in conjunction with the teachings of Boxhoorn taken as a whole. As explained above with regard to claim 1, step (c), Boxhoorn teaches that in the case where the carrier is impregnated with an aqueous solution containing both alkali metal salt and silver salt, the impregnated carriers are then heated to a temperature of between 100 and 400°C, preferably between 125 and 325°C. (Col. 5, lines 38- 41) In Examples 1 and 2, the drying temperatures are 250 to 270°C. Thus, Boxhoorn does not teach or suggest **calcining** after impregnation with the alkali metal salt. Instead, Boxhoorn teaches heating at much lower temperatures than calcination temperatures to reduce the silver salt to silver metal. Claim 25, a composition claim, does not disclose a calcining step after deposition of the alkali metal, and for this further reason does not anticipate claim 1 of the present application.

With respect to claim 2 of the present application, the Examiner relies upon claim 1 of Boxhoorn as teaching a step of depositing silver catalytic material on the calcined carrier. Applicants note that while claim 1 of Boxhoorn does disclose impregnating silver catalytic material on a carrier, as explained above, the carrier in Boxhoorn is not a preformed alpha-alumina carrier which has been impregnated with at least one alkali metal hydroxide and subsequently calcined prior to the impregnation of the silver. Thus, Boxhoorn does not anticipate claim 2 of the present application.

The Examiner relies upon claim 3 of Boxhoorn to reject claims 11 and 12 of the present application, finding that Boxhoorn carries out calcining at a temperature of 800 to 1200°C. Boxhoorn teaches that alpha-alumina is formed at calcination temperatures of 1200 C and higher. Practicing claim 3 of Boxhoorn does not result in an alpha-alumina carrier. For the reasons explained above, the use of such calcination temperatures teaches away from the claims of the present invention, which require **alpha-alumina** to be impregnated with the modifier.

Claim 5 of the present application specifies that the alpha-alumina carrier of claim 1 or claim 2 is prepared by contacting boehmite alumina and/or gamma-alumina with an acidic mixture containing halide anions and water. The Examiner cites to Boxhoorn, claim 2 and column 1, line 54 –column 2, line 2 as anticipating claim 5. Boxhoorn does not disclose contacting boehmite alumina and/or gamma alumina with an acidic mixture containing halide anions and water. Rather, Boxhoorn discloses several compounds, one of which is an alkali metal fluoride salt, which can be added to the boehmite alumina and/or gamma alumina. Boxhoorn does not teach that an **acidic** mixture is present.

Thus, the cited portions of Boxhoorn do not anticipate claim 5. Further, because claim 5 depends from claim 1 or claim 2, and because claims 1 and 2 each have at least one element which is not present in the prior art, claim 5 is also not anticipated.

With regard to claims 6, 7, and 8 of the present application, which all depend directly or indirectly from claim 1 or 2, because claims 1 and 2 each have at least one element which is not present in the prior art, claims 6, 7, and 8 are also not anticipated.

Finally, with regard to claim 9, which depends from claim 1 or 2, because claims 1 and 2 each have at least one element which is not present in the prior art, claim 9 is not anticipated. Moreover, the ranges of claim 15 of Boxhoorn are not co-extensive with the ranges recited in claim 9 of the present application.

It is established law that: "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). For the reasons explained above,

at least one element of claims 1-3 and 5-10 is not found in Boxhoorn and the claims are not anticipated.

### **Claim Rejections - - 35 U.S.C. § 103**

Claim 4 is rejected under 35 U.S.C. § 103 (a) as being unpatentable over US Patent No. 4,874,739 (Boxhoorn) as applied to claim 1 or 2 above, in view of US Patent No. 4,994,589 (Notermann). Applicants respectfully traverse this rejection.

According to the Examiner, Boxhoorn teaches a process for the preparation of a silver-containing catalyst suitable for the oxidation of ethylene to ethylene oxide. Boxhoorn teaches an extrusion of the alumina mixture in the form of shaped carrier particles (claim 22), specifically the shaped alpha-alumina particles comprise bars, rings pellets, tables and triangles (column 3, lines 5-9). The Examiner admits that Boxhoorn does not teach the shaped alpha-alumina carrier having a morphology comprising interlocking platelets. The Examiner finds that Notermann teaches a support consisting essentially of alpha-alumina and that the support particles have platelet-type morphology and are shown to be interlocking. The Examiner finds that it would have been obvious for one of ordinary skill in the art to “modify the product of Boxhoorn by including an interlocking platelet morphology in view of the teachings of Notermann”.

For the reasons provided with regard to claims 1 and 2 above, Boxhoorn does not disclose or teach the methods of the present invention. Nothing in Notermann supplies the teachings missing in Boxhoorn with regard to claims 1 and 2. Applicant notes that the methods of the present invention are applicable to preformed alpha-aluminas, including, but not limited to those with a morphology comprising interlocking platelets.

Finally, claim 10 is rejected under 35 U.S.C. § 103 (a) as being unpatentable over US Patent No. 4,874,739 (Boxhoorn), citing to claim 3 of Boxhoorn. Applicant traverses this rejection. Claim 10 is dependent on claim 1 or 2. Boxhoorn does not describe or teach the invention of claim 1 or 2 for the reasons explained above. Thus, claim 10 is also patentable. Applicant further notes that the added alkali metal compounds specified in Boxhoorn do **not** include sodium hydroxide. Further, as explained above, the added alkali metal compounds specified in Boxhoorn are added not to a preformed alpha-alumina carrier, but to non-alpha alumina materials. Thus,

there is no motivation to substitute the cesium or potassium hydroxide use in Boxhoorn with sodium hydroxide.

Applicants respectfully requests consideration of the rejection of claims 1-10 and further submit that claims 1-10 are in condition for allowance.

Respectfully submitted,

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